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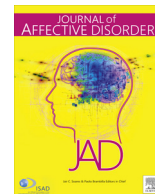
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Research paper

Negative perceptions of ageing predict the onset and persistence of depression and anxiety: Findings from a prospective analysis of the Irish Longitudinal Study on Ageing (TILDA)



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ABSTRACT

Background: Although there is a growing literature on the adverse health outcomes related with negative ageing perceptions, studies on their association with mental disorders such as depression and anxiety are scarce. Thus, the aim of the current study was to prospectively assess the association between negative ageing perceptions and incident/persistent depression and anxiety using nationally representative data from Ireland.

Methods: Data from two consecutive waves of the Irish Longitudinal Study on Ageing (TILDA) were analysed. The analytical sample consisted of 6095 adults aged ≥ 50 years. Validated scales for negative ageing perceptions, depression, and anxiety were used. Multivariable logistic regression analyses were used to assess the association between negative ageing perceptions at baseline and the onset and persistence of depression and anxiety at two-year follow up.

Results: After adjusting for potential confounders, negative ageing perceptions at baseline predicted the new onset of depression and anxiety at follow-up. Among those with depression or anxiety at baseline, negative ageing perceptions also predicted the persistence of these conditions at follow-up.

Limitations: Baseline data on negative ageing perceptions were used for the analysis and it is possible that scores could have changed over time.

Conclusions: Addressing negative perceptions towards ageing by developing interventions that activate positive ageing perceptions, and target societal attitudes by means of policy change, public campaigns, and community education programmes, may shift social perceptions and reduce the burden of depression and anxiety among the elderly.

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1. Introduction

It is estimated that by the year 2050, the number of people aged 60 or older will more than double worldwide – from 841 million to over 2 billion (United Nations, 2013). This increase in the older population will inevitably be accompanied by a disproportionate increase in mental disorders (World Health Organization, 2008), the implications of which will have a fundamental effect on the sustainability of health, economic, and welfare systems. Mental disorders such as depression and anxiety in late-life are major public health issues due to their high prevalence and poor

outcome (Byers et al., 2010). For example, depression occurring in late-life increases the risk of suicide, impairment of physical, cognitive, and social functioning, and leads to greater self-neglect, which in turn may precipitate earlier mortality (Fiske et al., 2009). Anxiety disorders are among the most common clinical problems reported among older adults, and their detrimental effects in late-life are comparable to those of depression (Wolitzky-Taylor et al., 2010). While a myriad of studies on the determinants of depression and anxiety among the elderly exist, one factor that has received little attention to date in relation to these mental health outcomes is ageing perceptions.

Self-perceptions of ageing, also referred to as ageing perceptions or attitudes towards ageing, describe individuals' experiences with the ageing process and expectations about the outcome and process of getting older (Wolff et al., 2015), and play an

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important role in older adults' ageing process (Levy et al., 2002a, b). It has been postulated that throughout the course of a person's life, beliefs about ageing are formed and shaped by personal experiences and broader societal attitudes, and these beliefs are speculated to influence outcomes via behavioural, physiological, and psychological pathways, which may in turn affect health outcomes (Levy, 2009). In recent years, a growing body of literature has documented the association between negative ageing perceptions and various health outcomes such as physical health and functioning (Wurm et al., 2007; Sargent-Cox et al., 2014; Robertson and Kenny, 2015), cognitive functioning (Levy, 1996; Hess et al., 2003; Robertson and Kenny, 2015), anxiety (Levy et al., 2014), depression (Lai, 2009; Sindi et al., 2012; Wurm and Benyamini, 2014), and mortality (Kotter-Grühn et al., 2009).

Previous studies investigating the association between negative ageing perceptions and depression have found a positive correlation between the predictor and outcome. Specifically, in a large prospective study on older adults in Germany, negative ageing perceptions predicted more depressive symptoms at follow-up (Wurm and Benyamini, 2014). Furthermore, a large cross-sectional study on older Chinese adults revealed that those with a more positive attitude towards ageing reported better mental health outcomes (Lai, 2009). Finally, a Canadian cross-sectional study found that increased negative perceptions of ageing significantly increased depressive symptomatology among older adults (Sindi et al., 2012). Of these three studies that addressed depressive symptoms, only the German study was nationally representative and prospective in design, but did not focus on the persistence of symptoms. The remaining two studies were cross-sectional and were neither nationally representative, nor did they use standardised or validated measures to assess negative ageing perceptions (Lai, 2009; Sindi et al., 2012). In terms of anxiety, only one large cross-sectional study among U.S. veterans addressed this condition, and found that negative perceptions of ageing was associated with anxiety (Levy et al., 2014). However, since this study was conducted among veterans, generalizability to the general population may be questionable. Therefore, an investigation that overcomes these limitations is necessary. In addition, studies from diverse contexts are needed as the influence of negative ageing perceptions on the health of older adults is postulated to differ across cultures and countries (Levy and Langer, 1994).

Ireland is a particularly apposite setting to study this association. For example, it is projected that by 2045, there will be more Irish citizens over the age of 65 than in the age group of 0–14 years (Długosz, 2011). Furthermore, a high prevalence of major depressive disorder and generalized anxiety disorder have been reported among older adults (Barry et al., 2009), while a recent study has shown that age stereotypes have become more negative in a linear way in Ireland (Reuben et al., 2015). In addition, negative ageing perceptions have been reported to be associated with various negative health outcomes in this setting (Robertson and Kenny, 2015) but there are no studies on mental health outcomes.

Thus, the aim of the current study was to assess whether negative ageing perceptions predict the onset and persistence of depression and anxiety among older Irish adults. To achieve this aim, we conducted a prospective study using data from the first two waves of the Irish Longitudinal Study on Ageing (TILDA) which is a nationally representative community-based survey of the Irish older population. Based on previous literature, we hypothesised that negative ageing perceptions at baseline will predict both the onset and persistence of depression and anxiety in our sample. Determining the nature of the association between negative ageing perceptions and mental health outcomes may help establish public health interventions to reduce the burden of mental disorders in the elderly.

2. Methods

2.1. Study design and sample

We analysed data from two consecutive waves of the TILDA survey conducted by Trinity College Dublin. Full details of the survey and its sampling procedure have been described elsewhere (Cronin et al., 2013; Kearney et al., 2011; Whelan and Savva, 2013; Kenny et al., 2010). In brief, this was a nationally representative population-based survey of older adults residing in Ireland. The survey was conducted between October 2009 and February 2011 for Wave 1 (W1), and between April 2012 and January 2013 for Wave 2 (W2). The target sample included all individuals residing in a household aged 50 and over. Nationally representative samples were derived from clustered random sampling of all households in Ireland. The baseline survey (W1) excluded participants who were institutionalised, and those with a doctor's diagnosis of dementia. In addition, those who were unable to personally provide written informed consent to participate in the survey because of severe cognitive impairment (judged at the interviewer's discretion) were also excluded from W1. Data collection was conducted by trained interviewers using Computer Assisted Personal Interviewing (CAPI), and by self-completion questionnaires (SCQs) which were returned after the interview. All participants were subject to CAPI interviews, and were also asked to complete the SCQ. The response rate of W1 was 62%, and of those who participated in the survey, 84% returned the SCQ at W1 (Kearney et al., 2011; Whelan and Savva, 2013).

W1 comprised of 8504 people aged ≥ 50 years ($n=8175$) and their spouses or partners younger than 50 years ($n=329$). Of these 8504 people, follow-up data for 7207 participants were available at W2. Our analysis restricted the sample to: participants aged 50 years and above at W1; participants who returned the SCQ at W1; and those who provided information on anxiety and/or depression at W2. We used these restrictions as information on negative ageing perceptions and some other variables used in the analysis were obtained from the SCQ at W1. Furthermore, anxiety and depression were the only variables from W2 that were used in our analysis. In W2, information on anxiety and depression was obtained via the standard in-person CAPI interview. The sample size after restriction to these individuals was 6095, comprising 12,190 person years of follow-up. Ethical approval for TILDA was obtained by the Faculty of Health Sciences Ethics Committee of Trinity College Dublin. Written informed consent was obtained from all participants.

2.2. Measures

2.2.1. Depression and anxiety

The same method of assessment for both depression and anxiety at W1 and W2 were employed. The scale used for depressive symptoms was the 20-item Center for Epidemiologic Studies Depression (CES-D) (Radloff, 1977), which assesses symptoms experienced in the seven days preceding the survey. The 20 items were scored on scales from 0 (rarely or none of the time, less than one day in the week) to 3 (most or all of the time, five to seven days in the week) with four items reverse coded (recoded so that all items were based on the same scale). Scores were summed to create a scale that ranged from 0 to 60, with higher scores indicating more depressive symptoms. The validity of the CES-D scale as a measure of depression in community-dwelling older adults has been well-documented (Hertzog et al., 1990; Lewinsohn et al., 1997). Depression was defined as a score of ≥ 16 . This cut-off point has been associated with 100% sensitivity and 88% specificity for major depression in community dwelling older adults (Beekman et al., 1997).

Anxiety symptoms were assessed with the anxiety subscale of the Hospital Anxiety and Depression Scale (HADS-A) (Zigmond and Snaith, 1983). The HADS-A scale measures the presence of anxiety symptoms with no specific time frame. The scale consists of seven items rated on a four-point scale from 0 (not at all) to 3 (very often indeed), with five items reverse coded. The scores of the seven items were summed to create a scale that ranged from 0 to 21, with higher scores indicating more symptoms of anxiety. The HADS-A has been found to have good sensitivity and specificity for assessing anxiety disorders across all ages in the general population (Bjelland et al., 2002), and among specific age groups of older adults (Spinoven et al., 1997). Anxiety was defined as a score of ≥ 8 . This cut-off point has been associated with 89% sensitivity and 75% specificity for generalized anxiety disorder (Bjelland et al., 2002; Olsson et al., 2005).

2.2.2. Negative ageing perceptions

Negative ageing perceptions were assessed with the Brief Ageing Perceptions Questionnaire (B-APQ) (Sexton et al., 2014). The scale consists of 17 items rated on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree), with six items reverse coded. Scores were summed to create a scale that ranged from 17 to 85, with higher scores indicating higher levels of negative ageing perceptions. The B-APQ has been psychometrically validated for use with the Irish population aged ≥ 50 , and has been found to have good internal consistency and construct validity (Sexton et al., 2014). This concise version of the APQ has preserved the internal consistency and construct validity of the original, and its brevity makes it particularly suitable for use with large-scale adult population surveys. The final 17-item, 5-dimension model was found to be consistent with the original conceptual model and fit the data well (Sexton et al., 2014). The exact 17 questions of the B-APQ can be found in Appendix 1.

2.2.3. Control variables

Sociodemographic characteristics included gender, age (50–59, 60–69, 70–79, and ≥ 80 years), education, and employment status. Education was classified as: primary (some primary/not complete; primary or equivalent); secondary (intermediate/junior/group certificate or equivalent; leaving certificate or equivalent); and tertiary (diploma/certificate; primary degree; postgraduate/higher degree). Current employment status was categorised as: employed (employed and self-employed, including farming); retired; and unemployed (unemployed, permanently sick or disabled, looking after home or family, or in education or training).

The number of chronic medical conditions was assessed by the question “has a doctor ever told you that you have any of the conditions on this card?” Responses included 17 conditions: high blood pressure or hypertension; angina; heart attack (including myocardial or coronary thrombosis); congestive heart failure; diabetes or high blood sugar; stroke (cerebral vascular disease); ministroke or transient ischemic attack; high cholesterol; heart murmur; abnormal heart rhythm; any other heart trouble; chronic lung disease such as chronic bronchitis or emphysema; asthma; arthritis (including osteoarthritis, or rheumatism); osteoporosis; cancer or a malignant tumour (including leukaemia or lymphoma but excluding minor skin cancers); cirrhosis or serious liver damage. The total number of chronic medical conditions was calculated and categorised as 0 (none), 1, or ≥ 2 . Cognitive function was assessed with the Montreal Cognitive Assessment (MoCA) (score range 0–30). This tool has been validated in the older Irish population (Kenny et al., 2013), and includes measures of executive function, language, memory, attention, orientation, calculation and visuospatial ability. Cognitive impairment was defined as a MoCA score < 26 (Freitas et al., 2013). Difficulties with six types of activities of daily living (ADL) [dressing, walking, bathing, eating,

getting in or out of bed, and using the toilet (Katz et al., 1963)] were assessed by asking participants to indicate whether they had difficulty performing these activities. ADL disability was defined as having difficulty with at least one of these ADLs.

2.3. Statistical analysis

Analysis was done with Stata version 13.1 (Stata Corp LP, College Station, Texas). A descriptive analysis was conducted to demonstrate the baseline sample characteristics. These analyses included unweighted frequencies, means, and standard deviations. The mean (SD) of the negative ageing perception scale was calculated by each sample characteristic at baseline. The difference between each sample characteristic in terms of the negative ageing perception scale was tested with Student's *t*-tests and one-way ANOVA for variables with two and ≥ 3 categories respectively.

Multivariable logistic regression analysis was used to assess the associations between negative ageing perception and depression or anxiety. Negative ageing perception (exposure variable) was based on data collected at W1. The four outcomes were incident depression, incident anxiety, persistent depression, and persistent anxiety. Incident depression and anxiety were assessed among those without depression or anxiety respectively at baseline (W1), and referred to new cases of depression or anxiety at W2 (outcome). Thus, those with depression at baseline were omitted from the analysis on incident depression, and similarly, those with anxiety at W1 were excluded from the analysis on incident anxiety. On the other hand, persistent depression and anxiety were evaluated only among those who had depression or anxiety at W1 respectively, and were defined as the presence of depression or anxiety at W2. The models were adjusted for sex, age, education, employment status, number of chronic medical conditions, ADL disability, and cognitive impairment based on information obtained at W1. The selection of control variables was based on past literature (Levy et al., 2002a,b; Djernes, 2006; Lai, 2009; Vink et al., 2008; Chachamovich et al., 2008; Byers et al., 2010; Han and Richardson, 2015). With the exception of the negative ageing perception scale, all variables were included in the models as categorical variables. Since information on cognition was missing for approximately one fifth of the participants, we included a missing category for this variable in the models in order to retain as many participants as possible in the analysis. Furthermore, in order to assess whether the association between negative ageing perceptions and the mental health outcomes differs by age, we tested for effect modification by age group (50–59, 60–69, 70–79, 80+ years) by including the product term age group X negative ageing perception in the models. Sampling weights were generated with respect to age, sex, and educational attainment to the Quarterly National Household Survey 2010. In all analyses, the sample weighting and the complex study design including clustering within households were taken into account to obtain nationally representative estimates using the Stata *svy* command. Results are expressed as odds ratios (ORs) and 95% confidence intervals (95% CIs). A *p*-value < 0.05 was considered to be statistically significant.

3. Results

The average age (SD) of the analytical sample ($n=6095$) was 63.3 (9.0) years, and 51.7% were females. The prevalence (*n*) of depression and anxiety at baseline were 9.8% (532) and 24.9% (1418) respectively. The sample characteristics and their association with negative ageing perceptions are presented in Table 1. Male sex, older age, lower education, higher number of chronic medical conditions, ADL disability, cognitive impairment, depression, and anxiety were associated with higher mean scores on the

Table 1
Baseline characteristics of the study sample.

Characteristic	Category	N	Negative ageing perceptions ^a Mean (SD)	P-value ^b
Sex	Female	3320	40.8 (8.9)	< 0.001
	Male	2775	41.7 (7.7)	
Age (years)	50–59	2483	39.5 (7.8)	< 0.001
	60–69	2010	40.6 (8.4)	
	70–79	1217	44.5 (7.6)	
	80+	385	47.7 (6.5)	
Education ^c	Primary	1604	44.0 (7.0)	< 0.001
	Secondary	2517	40.4 (7.6)	
	Tertiary	1966	38.9 (10.2)	
Employment status ^d	Employed	2281	39.0 (7.7)	< 0.001
	Retired	2251	43.0 (8.5)	
	Unemployed	1484	42.5 (8.0)	
Chronic medical conditions ^e	None	1425	39.5 (7.9)	< 0.001
	One	1723	40.2 (8.0)	
	Two or more	2947	42.8 (8.3)	
ADL disability ^f	No	5609	40.8 (8.2)	< 0.001
	Yes	486	46.3 (7.7)	
Cognitive impairment ^g	No	2491	39.2 (8.2)	< 0.001
	Yes	2445	42.5 (7.9)	
Depression ^h	No	5481	40.7 (8.1)	< 0.001
	Yes	532	46.7 (8.1)	
Anxiety ⁱ	No	4461	39.9 (7.9)	< 0.001
	Yes	1418	45.1 (7.9)	

Abbreviation: ADL – Activities of Daily Living.

All estimates are based on weighted data.

^a Negative ageing perceptions were based on a scale ranging from 17 to 85 with higher scores indicating higher levels of negative ageing perception.

^b The difference between each sample characteristic in terms of the negative ageing perception scale was tested with Student's *t*-tests and one-way ANOVA for variables with two and ≥ 3 categories respectively.

^c Primary Education refers to having completed primary level education, or lower; Secondary Education refers to having completed intermediate or leaving certificate examinations; Tertiary Education refers to having completed a diploma, primary, or higher degree.

^d Employed (employed and self-employed, including farming); Unemployed (unemployed, permanently sick or disabled, looking after home or family, or in education or training).

^e Seventeen types of chronic medical conditions were assessed.

^f ADL disability was defined as having difficulty with at least one of the following ADLs: dressing, walking, bathing, eating, getting in or out of bed, and using the toilet.

^g Cognitive impairment was assessed with the Montreal Cognitive Assessment (MoCA) and referred to a score < 26 .

^h Depression was assessed using the Center for Epidemiologic Studies Depression (CED-S) scale and scores ranged from 0 to 60, with the cut off for depression being ≥ 16 .

ⁱ Anxiety was assessed using the anxiety subscale of the Hospital Anxiety and Depression Scale (HADS-A) which is based on a scale from 0 to 21 with the cut off for anxiety being ≥ 8 .

negative ageing perception scale. The association between negative ageing perception and incident or persistent depression and anxiety adjusted for gender, age, education, occupation, chronic medical diseases, disability, and cognitive impairment, estimated by logistic regression is illustrated in Table 2.

3.1. Incidence of depression and anxiety at follow-up

At two-year follow-up, there were 265 and 165 new cases of incident depression and anxiety respectively. The presence of negative ageing perceptions at baseline predicted the onset of depression and anxiety at follow-up. Specifically, among those with no depression at baseline, individuals with a higher negative perception of ageing at W1 were significantly more likely develop depression at follow up (OR 1.09, 95%CI = 1.06–1.11). This OR can be interpreted as the change in the odds of incident depression

associated with a one-point increase on the negative ageing perception scale (range 17–85) at baseline. The corresponding figure for anxiety (among those with no anxiety at baseline) was OR 1.04 (95%CI = 1.01–1.07).

3.2. Persistence of depression and anxiety at follow-up

Of those who had depression or anxiety at baseline, 50.0% and 35.2% continued to have these conditions at two-year follow-up respectively. Among those who had depression at baseline, higher levels of negative ageing perception at baseline predicted the persistence of depression at follow-up (OR 1.05; 95%CI = 1.02–1.07). The corresponding figure for anxiety (among those who had anxiety at baseline) was OR 1.04 (95%CI = 1.02–1.05).

There were no significant interactions between negative ageing perceptions and anxiety/depression by age group in any of the regression analyses, implying that the effect of negative ageing perceptions on mental health is consistent across age groups.

4. Discussion

The current study showed that higher levels of negative ageing perceptions at initial assessment were a significant predictor of the onset and persistence of both depression and anxiety at follow-up after adjustment for potential confounders. To the best of our knowledge, this is the first study on negative ageing perceptions and mental disorders among older Irish adults, and also the first to assess the association between negative ageing perceptions and the persistence of depression and anxiety. The strengths of the study include the large sample size, prospective design, and the use of nationally representative data. Furthermore, we used validated scales for negative ageing perceptions, depression, and anxiety, which have rarely been used collectively in studies on this topic.

Several study limitations should be borne in mind before the findings are discussed. First, since all data including depression and anxiety were obtained using self-reported measures, reporting-bias may be present. Second, baseline data on negative ageing perceptions and other control variables were used for the analysis. Consequently, it is possible that some conditions or characteristics of the respondents changed between the two waves. Third, the variable on depression was based on symptoms in the past seven days. Using different time frames may have yielded different results. The results may have also differed if clinical assessments for depression and anxiety were performed. Additionally, factors such as personality traits that could underlie both negative ageing perceptions and proneness to depression (Moor et al., 2006) were not taken into account in the analysis due to lack of data. Next, those who were not followed at W2 were more likely to have been older, unemployed, and of lower education at baseline. Thus, some degree of bias might have been introduced due to loss to follow-up. Finally, the W1 survey response rate was relatively low (62%). However, other epidemiological studies have found that poor response rates have a minimal effect on the risk estimates and in the identification of risk factors of psychiatric disorders (Batty and Gale, 2009; Bergman et al., 2010).

Our results on depression and anxiety are in line with the four previous studies on this topic (Wurm and Benyamini, 2014; Lai, 2009; Sindi et al., 2012; Levy et al., 2014). To date, the interplay of factors that contribute towards depression and anxiety in older adults have been established (Cole and Dendukuri, 2003; Vink et al., 2008). However, the mechanisms that link negative ageing perceptions with common mental disorders in the elderly remain unclear (Sargent-Cox et al., 2014). Nevertheless, several mechanisms may explain this association. First, people who have negative

Table 2

The association between negative ageing perceptions and incident or persistent depression and anxiety.

		Incident		Persistent	
		Depression	Anxiety	Depression	Anxiety
Negative ageing perceptions ^a		1.09 ^{***}	1.04 [*]	1.05 ^{**}	1.04 ^{***}
Sex	Female	[1.06,1.11]	[1.01,1.07]	[1.02,1.07]	[1.02,1.05]
	Male	1.00	1.00	1.00	1.00
Age (years)		0.53 ^{***}	0.52 ^{**}	0.92	0.60 ^{***}
	50–59	[0.39,0.73]	[0.33,0.81]	[0.57,1.49]	[0.45,0.80]
	60–69	1.00	1.00	1.00	1.00
		0.41 ^{***}	0.35 ^{***}	0.56	0.60 ^{**}
	70–79	[0.27,0.62]	[0.20,0.61]	[0.31,1.01]	[0.44,0.82]
	80+	0.26 ^{***}	0.37 ^{**}	0.77	0.38 ^{***}
Education ^b		[0.16,0.43]	[0.19,0.72]	[0.37,1.59]	[0.23,0.63]
		0.29 ^{**}	0.23 [*]	0.36	0.36
	Primary	[0.14,0.60]	[0.09,0.64]	[0.09,1.47]	[0.15,0.89]
	Secondary	1.00	1.00	1.00	1.00
	Tertiary	0.79	1.04	0.79	0.69 [*]
Employment status ^c		[0.53,1.18]	[0.62,1.73]	[0.47,1.32]	[0.50,0.95]
	Employed	0.86	0.94	0.72	0.79
	Retired	[0.56,1.32]	[0.53,1.69]	[0.38,1.35]	[0.54,1.15]
	Unemployed	1.00	1.00	1.00	1.00
Chronic medical conditions ^d		1.27	1.48	1.27	1.11
	None	[0.85,1.91]	[0.82,2.68]	[0.64,2.53]	[0.73,1.67]
	One	0.94	1.96 [*]	1.64	1.15
	Two or more	[0.61,1.46]	[1.18,3.28]	[0.93,2.87]	[0.81,1.63]
ADL disability ^e		1.00	1.00	1.00	1.00
	No	1.23	1.01	1.55	1.73 ^{**}
	Yes	[0.77,1.98]	[0.57,1.78]	[0.75,3.20]	[1.19,2.50]
Cognitive impairment ^f		1.64	1.52	1.38	1.64 [*]
	No	[1.10,2.43]	[0.93,2.49]	[0.73,2.61]	[1.15,2.34]
	Yes	1.00	1.00	1.00	1.00
		1.32	1.12	1.46	1.61 [*]
		[0.79,2.22]	[0.58,2.16]	[0.85,2.48]	[1.01,2.54]
		1.00	1.00	1.00	1.00
		1.42	0.96	0.82	0.82
		[0.70,1.43]	[0.94,2.14]	[0.56,1.65]	[0.60,1.11]

Abbreviation: ADL – Activities of Daily Living.

Data are odds ratio [95% Confidence Intervals]. Models are adjusted for all covariates in the table.

^a Negative ageing perceptions were based on a scale ranging from 17 to 85 with higher scores indicating higher levels of negative ageing perception.^b Primary Education refers to having completed primary level education, or lower; Secondary Education refers to having completed intermediate or leaving certificate examinations; Tertiary Education refers to having completed a diploma, primary, or higher degree.^c Employed (employed and self-employed, including farming); and Unemployed (unemployed, permanently sick or disabled, looking after home or family, or in education or training).^d Seventeen types of chronic medical conditions were assessed.^e ADL disability was defined as having difficulty with at least one of the following ADLs: dressing, walking, bathing, eating, getting in or out of bed, and using the toilet.^f Cognitive impairment was assessed with the Montreal Cognitive Assessment (MoCA) and referred to a score < 26.^{*} p < 0.05.^{**} p < 0.01.^{***} p < 0.001.

ageing perceptions might have a more negative outlook of the future, and expect to experience difficulties in their daily lives and relationships as they age, which may subsequently manifest as stress, depression, and anxiety. In the B-APQ, this mentality may be reflected in questions such as “I get depressed when I think about how ageing might affect the things that I can do” or “I worry about the effects that getting older may have on my relationships with others”. These ideas when compounded by the perceptions of low control of the ageing process, or a perception that the future cannot provide a prospect of better health, may have a more detrimental effect on mental health. Indeed, previous studies have shown that perceived control or optimism of the future are influential factors in the association between self-perceptions of ageing and various negative health outcomes including depression (Levy et al., 2002a,b; Wurm and Benyamini, 2014). Second, negative ageing perceptions may lead to more rapid decline in health due to less health care-seeking and engagement in preventative and health-promoting activities (Levy and Myers, 2004). Leventhal and Prohaska (1986) postulated that negative perceptions of

ageing could increase the chance that a person would attribute deteriorating health to old age, and therefore delay help seeking. This may also explain why negative ageing perceptions were linked to persistence of depression and anxiety in our study. It may be that those with negative ageing perceptions are less likely to seek health care for depression/anxiety because they believe that mental ill-health is part of the normal ageing process (Sarkisian et al., 2002).

Thirdly, the exposure, and subsequent processing and interpretation of negative ageing stereotypes by older adults may act as environmental stressors, which are inextricably linked with psychiatric conditions (Rozanov and Carli, 2012). The stress vulnerability model posits that those with less exposure to environmental stressors are less likely to experience a variety of psychiatric conditions compared to those who are more exposed (Rozanov and Carli, 2012). Experimental studies on negative ageing stereotypes have illustrated that older adults experience negative ageing stereotypes as environmental stressors, which increases their vulnerability to depression and other psychiatric

conditions (Levy et al., 2014). Additionally, the action of internalizing ageing stereotypes into constructs of one's self-perceptions on ageing has been postulated to result in a "self-fulfilling prophecy" of the stereotype (e.g., I will be depressed when I'm old) (Levy et al., 2002a). Finally, factors such as internalisation/stereotype embodiment, downward social comparison/resilience, and upward social comparison/role models may also be implicated in the association between negative ageing perception and mental health outcomes (Butzer and Kuiper, 2006; Bennett and Gaines, 2010; Quinn et al., 2014; Min et al., 2015; Dionigi, 2015).

Our findings provide further evidence of the potential role of negative ageing perceptions on poor health outcomes, and support actions to counteract the deleterious effects of negative ageing perceptions in order to prevent mental disorders among the elderly, and to promote successful ageing. Studies have illustrated that positive and negative ageing perceptions can be modified under experimental conditions (Levy, 1996). Priming stereotypes of ageing has been shown to have reliable influences on various aspects of older adults' functioning including cognition, behaviour, and physiology (Levy, 2003). For example, activating positive ageing stereotypes by using words such as wise, sage, and alert, has been reported to improve participants' performance on various memory tasks (Abrams et al., 2008, 2006). In a similar fashion, the activation of negative ageing stereotypes has been found to reduce the levels of subjective health and extraversion, and to increase feelings of loneliness (Coudin and Alexopoulos, 2010). Therefore, it may be beneficial to develop interventions that can activate and sustain positive ageing perceptions.

Levy and Langer (1994) have proposed that interventions should occur at both individual and community levels. At an individual level, Scholl and Sabat (2008) argue that older individuals should maintain their sense of perceived control, which can be achieved by giving them autonomy over personal decisions regarding their health. Additionally, the importance of promotion of optimism and positive emotions has been pointed out (Wurm and Benyamini, 2014). At a community-level, since negative ageing stereotypes are entrenched from an early age and older people's attitudes towards ageing is considered to be a reflection of societal attitude (Levy, 2009), interventions should be developed to target societal beliefs. Community education programmes and campaigns that foster understanding and respect between younger and older generations can also work towards shifting social perceptions towards ageing (Chase, 2005). Furthermore, in terms of structural or policy level interventions, societal planning for the engagement and involvement of older people and challenging of societal attitudes towards ageing are central to creating and sustaining positive ageing perceptions. Practical policy interventions, such as making reforms to the pension system and Equity Bill, which have already been put forward by the English government (Department for Work and Pensions, 2009), would outlaw unjustifiable age discrimination and facilitate continued engagement in society, thus fostering positive attitudes towards ageing. Further to this, supporting continued working of older citizens by changing the default retirement age for pensioners may counteract outdated stereotypes and assumptions about ageing and help shift attitudes and expectations of ageing across the whole society.

In conclusion, our study demonstrated that negative ageing perceptions predict the onset and persistence of depression and anxiety in older adults. Our findings suggest that addressing attitudes towards ageing may help reduce the burden of depression and anxiety among the elderly. Given that negative ageing perceptions are linked with a variety of health outcomes, addressing negative ageing perceptions and stereotypes may have a multi-outcome benefit. Intervention studies assessing the impact of addressing negative ageing perceptions on mental health, and its parallel impact on other health outcomes are warranted.

Moreover, future studies that assess how different dimensions of negative ageing perceptions predict adverse health outcomes may be important to understand the underlying mechanisms.

Appendix 1

Questions included in the Brief Ageing Perceptions Questionnaire (B-APQ):

1. I always classify myself as old.
2. I am always aware of the fact that I am getting older.
3. I feel my age in everything that I do.
4. As I get older I get wiser.
5. As I get older I continue to grow as a person.
6. As I get older I appreciate things more.
7. I get depressed when I think about how ageing might affect the things that I can do.
8. The quality of my social life in later years depends on me.
9. The quality of my relationships with others in later life depends on me.
10. Whether I continue living life to the full depends on me.
11. Getting older makes me less independent.
12. As I get older I can take part in fewer activities.
13. As I get older I do not cope as well with problems that arise.
14. Slowing down with age is not something I can control.
15. I have no control over the effects which getting older has on my social life.
16. I worry about the effects that getting older may have on my relationships with others.
17. I feel angry when I think about getting older.

* Answer options were: "Strongly disagree", "Disagree", "Neither agree nor disagree", "Agree", and "Strongly agree".

References

- Abrams, D., Crisp, R., Marques, S., Fagg, E., Bedford, L., Provias, D., 2008. Threat inoculation: experienced and imagined intergenerational contact prevents stereotype threat effects on older people's math performance. *Psychol. Aging* 23, 934–939.
- Abrams, D., Eller, A., Bryant, J., 2006. An age apart: the effects of intergenerational contact and stereotype threat on performance and intergroup bias. *Psychol. Aging* 21, 691–702.
- Barry, M.M., VanLente, E., Molcho, M., Morgan, K., McGee, H., Conroy, R.M., Perry, I., 2009. SLÁN 2007: Survey of Lifestyle, Attitudes and Nutrition in Ireland, Mental and Social Well-being Report. Department of Health and Children, Dublin, The Stationary Office, Dublin, Ireland.
- Batty, G.D., Gale, C.R., 2009. Impact of resurvey non-response on the associations between baseline risk factors and cardiovascular disease mortality: prospective cohort study. *J. Epidemiol. Commun. Health* 63, 952–955.
- Beekman, A.T., Deeg, D.J., VanLimbeek, J., Braam, A.W., DeVries, M.Z., VanTilburg, W., 1997. Criterion validity of the Center for Epidemiologic Studies Depression Scale (CES-D): results from a community-based sample of older subjects in The Netherlands. *Psychol. Med.* 27 (1), 231–235.
- Bennett, T., Gaines, J., 2010. Believing what you hear: the impact of aging stereotypes upon the old. *Educ. Gerontol.* 36, 435–445.
- Bergman, P., Ahlberg, G., Forsell, Y., Lundberg, I., 2010. Non-participation in the second wave of the PART study on mental disorder and its effects on risk estimates. *Int. J. Soc. Psychiatr.* 56, 119–132.
- Bjelland, I., Dahl, A.A., Haug, T.T., Necklemann, D., 2002. The validity of the Hospital Anxiety and Depression Scale. An updated literature review. *J. Psychosom. Res.* 52, 69–77.
- Butzer, B., Kuiper, N.A., 2006. Relationships between the frequency of social comparisons and selfconcept clarity, intolerance of uncertainty, anxiety, and depression. *Pers. Individ. Differ.* 41 (1), 167–176.
- Byers, A.L., Yaffe, K., Covinsky, K.E., Friedman, M.B., Bruce, M.L., 2010. High occurrence of mood and anxiety disorders among older adults: the national comorbidity survey replication. *Arch. Gen. Psychiatr.* 67 (5), 489–496.
- Chachamovich, E., Fleck, M., Laidlaw, K., Power, M., 2008. Impact of major depression and subsyndromal symptoms on quality of life and attitudes towards aging in an international sample of older adults 2008. *Gerontologist* 48 (5), 593–602.
- Chase, C.A., 2005. Effect of an intergenerational e-mail pen pal project on the

- attitudes of college students toward older adults. *Diss. Abstr. Int.* 66, 2122.
- Cole, M.G., Dendukuri, N., 2003. Risk factors for depression among elderly community subjects: a systematic review and meta-analysis. *Am. J. Psychiatry* 160 (6), 1147–1156.
- Coudin, G., Alexopoulos, T., 2010. 'Help me! I'm old!' How negative aging stereotypes create dependency among older adults. *Aging Ment. Health* 14 (5), 516–523.
- Cronin, H., O'Regan, C., Finucane, C., Kearney, P., Kenny, R.A., 2013. Health and aging: development of the Irish Longitudinal Study on Ageing health assessment. *J. Am. Geriatr. Soc.* 61, S269–S278.
- Department for Work and Pensions, Building a society for all ages, Crown copyright. 2009, 1–62.
- Dionigi, R.A., 2015. Stereotypes of aging: their effects on the health of older adults. *J. Geriatr.* 5, 1–9.
- Djernes, J.K., 2006. Prevalence and predictors of depression in populations of elderly: a review. *Acta. Psychiatr. Scand.* 113, 372–387.
- Ługosz, Y., 2011. Population ageing in Europe. *Procedia – Social and Behavioral Sciences*, vol. 19, pp. 47–55.
- Fiske, A., Wetherwee, J.L., Gatz, M., 2009. Depression in old age. *Annu. Rev. Clin. Psychol.* 5, 363–389.
- Freitas, S., Simões, M.R., Alves, L., Santana, I., 2013. Montreal cognitive assessment: validation study for mild cognitive impairment and Alzheimer disease. *Alzheimer Dis. Assoc. Disord.* 27 (1), 37–43.
- Han, J., Richardson, V.E., 2015. The relationships among perceived discrimination, self-perceptions of aging, and depressive symptoms: a longitudinal examination of age discrimination. *Aging Ment. Health* 19 (8), 747–755.
- Hertzog, C., Van Alstine, J., Usala, P.D., Hultsch, D.F., Dixon, R., 1990. Measurement properties of the Center for Epidemiological Studies Depression Scale (CES-D) in older populations. *Psychol. Assess.: J. Consult. Clin. Psychol.* 2 (1), 64–72.
- Hess, T.M., Auman, C., Colcombe, S.J., Rahhal, T.A., 2003. The impact of stereotype threat on age differences in memory performance. *J. Gerontol. B – Psychol.* 58, 3–11.
- Katz, S., Ford, A.B., Moskowitz, R.W., Jackson, B.A., Jaffe, M.W., 1963. Studies of illness in the aged. The index of ADL: a standardized measure of biological and psychosocial function. *JAMA* 21 (185), 914–919.
- Kearney, P.M., Cronin, H., O'Regan, C., Kamiya, Y., Savva, G.M., Whelan, B., Kenny, R., 2011. Cohort profile: the Irish Longitudinal Study on Ageing. *Int. J. Epidemiol.* 40 (4), 877–884.
- Kenny, R., Whelan, B., Cronin, H., Kamiya, Y., Kearney, P., O'Regan, C., et al., 2010. The Design of the Irish Longitudinal Study on Ageing. Trinity College Dublin, Dublin.
- Kenny, R.A., Coen, R.F., Frewen, J., Donoghue, O.A., Cronin, H., Savva, G.M., 2013. Normative values of cognitive and physical function in older adults: findings from the Irish Longitudinal Study on Ageing. *J. Am. Geriatr. Soc.* 61 (2), S279–S290.
- Kotter-Grühn, D., Kleinspehn-Ammerlahn, A., Gerstorf, D., Smith, J., 2009. Self-perceptions of aging predict mortality and change with approaching death: 16-year longitudinal results from the Berlin Aging Study. *Psychol. Aging* 24, 654–667.
- Lai, D.W.L., 2009. Older Chinese' attitudes towards aging and the relationship to mental health: an international comparison. *Soc. Work Health Care* 48, 243–259.
- Leventhal, E.D., Prohaska, T.R., 1986. Age, symptom interpretation, and health behaviour. *J. Am. Geriatr. Soc.* 34 (3), 185–191.
- Levy, B.R., Langer, E., 1994. Aging free from negative stereotypes: successful memory in china and among the American deaf. *J. Pers. Soc. Psychol.* 66 (6), 989–997.
- Levy, B., 1996. Improving memory in old age by implicit self-stereotyping. *J. Pers. Soc. Psychol.* 71, 1092–1107.
- Levy, B.R., 2003. Mind matters: cognitive and physical effects of aging self-stereotypes. *J. Gerontol. B – Psychol.* 58, 203–211.
- Levy, B.R., Slade, M.D., Kasl, S.V., 2002a. Increased longevity by positive self-perceptions of aging. *J. Pers. Soc. Psychol.* 83, 261–270.
- Levy, B., Slade, M., Kunkel, S., Kasl, S.V., 2002b. Longitudinal benefit of positive self-perceptions of aging on functioning health. *J. Gerontol. B – Psychol.* 57, 409–417.
- Levy, B., Myers, L.M., 2004. Preventive health behaviors influenced by self-perceptions of aging. *Prev. Med.* 39, 625–629.
- Levy, B., 2009. Stereotype embodiment: a psychosocial approach to aging. *Curr. Psychol. Dir. Sci.* 18, 332–336.
- Levy, B.R., Pilver, C.E., Pietrzak, R.H., 2014. Lower prevalence of psychiatric conditions when negative age stereotypes are resisted. *Soc. Sci. Med.* 119, 170–174.
- Lewinsohn, P.M., Seeley, J.R., Roberts, R.E., Allen, N.B., 1997. Center for Epidemiologic Studies Depression Scale (CES-D) as a screening instrument for depression among community-residing older adults. *Psychol. Aging* 12 (2), 277–287.
- Min, J.A., Lee, C.U., Chae, J.B., 2015. Resilience moderates the risk of depression and anxiety symptoms on suicidal ideation in patients with depression and/or anxiety disorders. *Compr. Psychiatry* 56, 103–111.
- Moor, C., Zimprich, D., Schmitt, M., Kliegel, M., 2006. Personality, aging self-perceptions, and subjective health: a mediation model. *Int. J. Aging Hum. Dev.* 63 (3), 241–257.
- Olsson, I., Mykletun, A., Dahn, A.A., 2005. The Hospital Anxiety and Depression Rating Scale: a cross-sectional study of psychometrics and case finding abilities in general practice. *BMC Psychiatry* 5, 46.
- Quinn, D.M., Williams, M.K., Quintana, F., Gaskins, J.L., Overstreet, N.M., Pishori, A., et al., 2014. Examining effects of anticipated stigma, centrality, salience, internalization, and outness on psychological distress for people with concealable stigmatized identities. *PLoS One* 9 (5).
- Radloff, L.S., 1977. The CED-D scale: a self-report depression scale for research in the general population. *Appl. Psychol. Meas.* 1, 385–401.
- Reuben, N.G., Allore, H.G., Trentalange, M., Monin, J.K., Levy, B.R., 2015. Increasing negativity of age stereotypes across 200 years: evidence from a database of 400 million words. *PLoS One* 10 (2), e0117086. <http://dx.doi.org/10.1371/journal.pone.0117086>.
- Robertson, D.A., Kenny, R.A., 2016. Negative perceptions of aging modify the association between frailty and cognitive function in older adults. *Pers. Individ. Differ.* (in press).
- Rozanov, V., Carli, V., 2012. Suicide among war veterans. *Int. J. Environ. Res. Public Health* 9, 2504–2519.
- Sargent-Cox, K.A., Anstey, K.J., Luszcz, M.A., 2014. Longitudinal change of self-perceptions of aging and mortality. *J. Gerontol. – B Psychol.* 69 (2), 168–173.
- Sarkisian, C.A., Hays, R.D., Mangione, C.M., 2002. Do older adults expect to age successfully? The association between expectations regarding aging and beliefs regarding healthcare seeking among older adults. *J. Am. Geriatr. Soc.* 50, 1837–1843.
- Scholl, J.M., Sabat, S.R., 2008. Stereotypes, stereotype threat and ageing: implications for the understanding and treatment of people with Alzheimer's disease. *Ageing Soc.* 28 (1), 103–130.
- Sexton, E., King-Kallimanis, B.L., Morgan, K., McGee, H., 2014. Development of the brief ageing perceptions questionnaire (B-APQ): a confirmatory factor analysis approach to item reduction. *BMC Geriatr.* 9, 14–44.
- Sindi, S., Juster, R.-P., Wan, N., Nair, N.P.V., Ying Kin, N., Lupien, S.J., 2012. Depressive symptoms, cortisol, and cognition during human aging: the role of negative aging perceptions. *Stress* 15 (12), 130–137.
- Spinhoven, P., Ormel, J., Sloekers, P.P., Kempen, G.I., Speckens, A.E., Vanhemert, A.M., 1997. A validation study of the Hospital Anxiety and Depression Scale (HADS) in different groups of Dutch subjects. *Psychol. Med.* 27 (2), 363–370.
- United Nations, 2013. World Population Ageing. Department of Economic and Social Affairs, Population Division.
- Vink, D., Aartsen, M.J., Schoevers, R.A., 2008. Risk factors for anxiety and depression in the elderly: a review. *J. Affect. Disord.* 106, 29–44.
- Whelan, B., Savva, G.M., 2013. Design and methodology of the Irish longitudinal study on ageing. *J. Am. Geriatr. Soc.* 61 (2), S265–S268.
- World Health Organisation, 2008. The Global Burden of Disease: 2004 update. WHO, Geneva, Switzerland.
- Wolff, J.K., Schütz, B., Ziegelmann, J.P., Warner, L.M., Wurm, S., 2015. Short-term buffers, but long-term suffers? Differential effects of negative self-perceptions of aging following serious health events. *J. Gerontol. B – Psychol. Sci. Soc. Sci.* 00, 1–7.
- Wolitzky-Taylor, K.B., Castriotta, N., Lenze, E.J., Stanley, M.A., Craske, M.G., 2010. Anxiety disorders in older adults: a comprehensive review. *Depress. Anxiety* 27, 190–211.
- Wurm, S., Tesch-Römer, C., Tomasik, M.J., 2007. Longitudinal findings on aging-related cognitions, control beliefs, and health in later life. *J. Gerontol. B: Psychol.* 62, 156–164.
- Wurm, S., Benyamini, Y., 2014. Optimism buffers the detrimental effect of negative self-perceptions of ageing on physical and mental health. *Psychol. Health* 29 (7), 832–848.
- Zigmond, A.S., Snaith, R.P., 1983. The hospital anxiety and depression scale. *Acta Psychiatr. Scand.* 67 (6), 361–370.